

REMARKS

I. Introduction

By the present Amendment, claims 1 and 4-10 have been amended. No claims have been added or cancelled. Accordingly, claims 1-10 remain pending for examination. Claims 1 and 10 are independent.

II. Office Action Summary

In the Office Action of May 12, 2011, claims 4-9 were rejected under 35 USC §112, second paragraph, as being indefinite. Claims 1-3, 5, and 10 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 7,274,363 issued to Ishizuka et al. ("Ishizuka") in view of U.S. Patent No. 5,990,629 issued to Yamada et al. ("Yamada"). Claim 4 was rejected under 35 USC §103(a) as being unpatentable over Ishizuka in view of Yamada, and further in view of U.S. Patent Application No. 2002/0030647 to Hack et al. ("Hack"). Claims 6 and 7 were rejected under 35 USC §103(a) as being unpatentable over Ishizuka in view of Yamada, and further in view of U.S. Patent No. 6,518,962 issued to Kimura et al. ("Kimura"). Claims 8 and 9 were rejected under 35 USC §103(a) as being unpatentable over Ishizuka in view of Yamada, and further in view of U.S. Patent No. 6,414,443 issued to Tsuruoka et al. ("Tsuruoka"). These rejections are respectfully traversed.

III. Rejections under §112

Claims 4-9 were rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention. Regarding this rejection, the Office Action indicates that these claims contain reference to either "a control circuit" or "said control circuit."

However, independent claim 1, from which these claims depend, recites "a control circuit for increasing a voltage."

By the present Amendment, Applicants have amended claims 4-9 to recite --a voltage control circuit-- in order to distinguish from the control circuit recited in independent claim 1. Withdrawal of this rejection is therefore respectfully requested.

IV. Rejections under 35 USC §103

Claims 1-3, 5, and 10 were rejected under 35 USC §103(a) as being unpatentable over Ishizuka in view of Yamada. Regarding this rejection, the Office Action indicates that Ishizuka discloses a display apparatus that includes a pixel array including a plurality of pixels. Each pixel is indicated as including a light emitting unit, a drive element, and a switching element for controlling the drive element. The Office Action further indicates that the display apparatus includes a data signal drive circuit for receiving image data for each frame period, a scanning signal drive circuit for outputting a scanning signal, and a current source.

The Office Action admits that Ishizuka fails to disclose a control circuit for increasing a voltage applied to the light emitting unit while pixels with small gray scale numbers are emitting no light and pixels with large gray scale numbers are emitting light within each frame period. Yamada is relied upon for disclosing a control circuit for increasing a voltage applied to the light emitting unit in the same manner as the claimed invention. The Office Action concludes that it would have been obvious to combine the teachings of Yamada with those of Ishizuka in order to provide a more uniform luminance amongst the pixels and arrive at the claimed invention. Applicants respectfully disagree.

Independent claim 1 has been amended to recite a display apparatus that comprises, in part:

a control circuit for continuously increasing a voltage applied to said light emitting unit while pixels with small gray scale numbers are emitting no light and pixels with large gray scale numbers are emitting light within said each frame period.

The control circuit provided in independent claim 1 continuously increases the voltage being applied to the light emitting unit. This is done while pixels with small gray scale numbers are emitting no light and pixels with large gray scale numbers are emitting light within each frame period. As discussed in the Specification, the display synchronous cathode potential control circuit (27) controls the output voltage during each frame period. See Fig. 19 and paragraph [0085] of the published application. During a time period when pixels with large gray scale numbers are emitting light (and those with small gray scale numbers are emitting no light), the display synchronous cathode potential control circuit (27) reduces the cathode side potential of the organic EL elements (24). This results in an increase in the voltage between both electrodes of the organic EL element (24) in accordance with the display phase signal (63).

The Office Action alleges that the combination of Ishizuka and Yamada discloses all of the features recited in independent claim 1. Applicants respectfully disagree with this conclusion. At the outset, Applicants note that the Office Action admits the failure by Ishizuka to disclose a control circuit as set forth in the claimed invention. Yamada, however, does not appear to disclose a control circuit as further clarified by the present Amendment. Specifically, Yamada discloses a gradation display system wherein one frame period for displaying, or maintaining the display

of, an image is set to 16.7 ms, and the frame period is divided into four (4) sub-frame periods. Each sub-frame period consists of an address period T_{add} for performing an address write operation. See column 35, line 60 to column 36, line 5. Each sub-frame period also includes a light emission setting period in which a drive voltage is applied. The drive voltage is applied such that the luminance of a selected organic EL element (101) is 1:2:4:8 in the first to fourth sub-frames during the light emission setting period.

As illustrated in Fig. 23, however, the voltages are applied at the beginning of the light emission setting period (T_E) and remain at a constant value until the end of the light emission setting period, at which point the value is returned to 0 during the address period (T_{add}). During the second light emission period, for example, the voltage value V_2 is applied in the same manner. As clearly illustrated in the figures, however, there is no continuous increase in the voltage being applied within one frame period, and certainly no continuous increase in the voltage being applied during the individual sub-frame periods. Yamada also does not appear to provide any disclosure that would lead one to believe that the voltages can be applied in a continuously increasing manner during any portion of the frame period, particularly in the same manner now recited in the claimed invention. Consequently, the combination of Ishizuka and Yamada still fails to provide any disclosure or suggestion features now recited in independent claim 1, such as:

a control circuit for continuously increasing a voltage applied to said light emitting unit while pixels with small gray scale numbers are emitting no light and pixels with large gray scale numbers are emitting light within said each frame period.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claims 2-9 depend from independent claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

By the present Amendment, Applicants have also amended independent claim 1 to define a method for displaying an image based on image data by using a pixel array that includes a plurality of pixels. Each of the pixels includes a light emitting unit, a drive element for controlling the supply of current to the light emitting unit, and a switching element for controlling the drive element according to an image signal. The method comprises, in part:

continuously increasing a voltage applied to said light emitting unit while pixels with small gray scale numbers are emitting no light and pixels with large gray scale numbers are emitting light within said each frame period.

Thus, similar to independent claim 1, the method of independent claim 10 now recites a step of continuously increasing the voltage applied to the light emitting unit. Again, this is done while pixels with small gray scale numbers are emitting no light, and pixels with large gray scale numbers are emitting light within each frame period. As previously discussed, these features are not shown or suggested by the art of record.

It is therefore respectfully submitted that independent claim 10 is allowable over the art of record.

V. Conclusion


For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 1497.43143X00).

Respectfully submitted,
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